

DARTON SLEEVES™



Ford™ 4.6 Installation Manual

MID™
MODULAR
INTEGRATED
DECK



Thank you for purchasing the Darton state of the art new **MID Sleeve Kit, US Patent No. 6,799,541**. The kit makes possible maximum bore sizes, increased cylinder strength and superior wear resistance.

Darton wants to provide you with the best technical information we have available to ensure that your sleeved engine will perform to your expectations. Because the **MID** ductile iron sleeve kit “reinvents” the block structure with substantially increased bore wall thickness, certain operational characteristics become more like diesel engine technology than gasoline engine. Therefore, we have formulated a program of required procedures and components, which we believe will ensure operating success of your sleeved engine in whatever application it will see service in.

Note: The Ford™ 4.6L M.I.D. Kit requires the use of Ford’s™ Cobra jet 4 valve cylinder heads and gaskets. The use of other heads may require modification of the head at the oil pressure transfer passage. See Darton for details.

INSTALLATION PROCEDURES

NOTES:

Revised: 03.28.2005

Ford 4.6 liter MID Sleeve Kits

Read and make sure you understand these instructions before proceeding with block machining. If you have questions concerning machining, assembly, proper tooling, machines, etc. call sales at Darton.

PREPARATION, FIXTURING:

1. The block needs to be fully stripped, cleaned and inspected before machining. Main web cracks, or structural damage may prevent satisfactory sleeve installation. Blocks with cracked factory liners are good candidates for sleeving as long as the crack doesn't extend to the bottom most 1.5" of cylinder wall.

SETUP AND BLOCK MACHINING:

1. With your block mounting fixture securely bolted to the CNC machine table, indicate the centerline of your block mounting bar in the "Y" axis direction. That will be your "Y" fixture or part offset depending on terminology used with your machine. You will only have to do this one time since this position will remain the same. The object is to correct for factory machining errors, block warpage. You want the MID sleeves installed directly over the crankshaft axis and not offset as would probably happen if you merely went off the existing cylinder centerline.

Now set the block up on the CNC machine. The preferred method is with precision made mounting rings located in the front and rear main bearing bores and with the bell housing face securely bolted to a fixture plate. Rotate your fixture so the left (driver's side bank) is facing up. Indicate the rear deck surface of the block - **photo 1**. Rotate the block around the crank axis until you get close to zero run out across the deck from side to side. Lock your fixture when you are satisfied the block is true. Zero the degree wheel if so equipped. Note that most blocks will be warped front to back. I recommend dialing in the deck surface at the rear of the block. Note the photo shows indicating the front of the block. Now indicate the "X" centerline of cylinder number five, (left bank first cylinder) - **photo 2**. The centerline position is your "X" fixture offset position. Enter the "X" and "Y" offsets in your machine's fixture or part offset table.

2. Clean the rust preventative from the sleeves using laquer thinner. Measure the bottom diameter, the upper flange diameter, and the seating depth of each sleeve. Generally the diameters will be very close - within .001" in any one set. Measure the diameters at 90 degrees and average the result. The average diameter at the lower seal surface of the new MID sleeves is 3.877". This will vary about a thousandth plus or minus. If the largest sleeve averages out at 3.877" and the smallest at 3.876" use 3.8765" as your boring size for that part of the installation. The sleeves should be installed plus or minus .0003" of the measured size. Do not attempt to install MID sleeves if you can not hold this tolerance. Call Darton for info on proper tooling and or machines to ensure a satisfactory job. Note that the seating depth of the sleeves may vary a bit. This is not critical since the block will be decked after the sleeves are installed. Average sleeve seating height is right around 4.250". We machine the block shy of this figure so the sleeves protrude a bit after installation.
3. Touch off your tools on the deck surface at the front of the left bank either before you begin machining or as you are about to use them, whichever you prefer. Set your tool length offsets into your machine's tool table. Machining depths are from the deck surface down.
4. Note that the bore center to center is 3.9382". You need to keep this centerline dimension to $\pm .0005$ ". Note that in order to maintain the required tolerances it is mandatory to use a machine with flood coolant. It will be impossible to hold tolerance otherwise and a poor job will be the result.
5. First operation is to bore the four cylinders on the left bank to your finished bore size + .010" diameter to the main bearing webs - **photo 3**. Depth of cut is 5.960" from the deck surface to the main webs.
6. Next you will machine to the o'ring diameter to a depth of 5.350" and to a nominal diameter of 3.8765". This diameter is your average measured diameter of the sleeve o'ring area. A net fit is preferred and no more than .0005" press fit should be used.
7. Next operation removes the remaining cylinder walls to a diameter of 4.350" and to a depth of 4.220". **Photos 5 and 6**.

If the block you are machining is a used block, go on to instruction (8). Else follow the instructions below if the block is a brand new never run casting.

If this is a brand new block you are working on it MUST be stress relieved after the roughing operations. It will warp in service distorting the sleeves if this is not done. Rotate the block 90 degrees to get the right bank vertical. Perform the above steps (5 thru 7) on the right bank. You must change the "X" axis fixture or part offset (depending on your machine) for the right bank. The offset is $-.9435$ ". In other words the bore centerline of cylinder 1 is .9435" offset towards the

NOTES:

front of the block from cylinder five. Do not alter the "Y" offset position. This will always stay the same unless you remove the fixture from the machine.

Remove the block from the machine, clean and have the block vibratory stress relieved. If you have questions, call Darton sales dept. for info on machines to perform this operation.

After stress relief, remount the block on the machine with the left bank facing up. Indicate the left bank as in instruction (1) above. Indicate the "X" axis centerline of cylinder five. Enter that position in your machine's fixture or part offset table as you did in instruction one. Continue on to step (8).

8. Next, machine the upper flange diameter to your measured diameter in step (2) $+0.001$ ". The nominal diameter on the sleeve flange is 4.701". Your flange bore should be 4.702" machined to a depth of .550". You can bore or use circular interpolation for this cut dependent on your tooling and expertise. If you use circular interpolation with a carbide end mill, use two passes leaving $\sim .010$ " for the finish pass - **photo 7**. This will ensure a better surface finish and rounder hole.
9. Next, install a long insert style end mill that has .030" radius inserts. You will use interpolation milling for the sleeve seating surfaces. Use circular interpolation to cut a 4.300" diameter to a depth of 4.245". This depth will leave the sleeves protruding .005" after installation. Again, use plenty of coolant to prevent buildup on the tool - **photo 8**.
10. Finish the left bank by cutting a chamfer at each seating surface ID to facilitate the o'ring passing during installation. I prefer a 45 degree chamfer cut to a depth of .025". If you use a tool like that shown in the photo adjust the spindle speed to ~ 60 rpm to prevent chatter. **Photo 9**.
11. Repeat operations (8 through 10) on the opposite bank after indexing the block 90 degrees. Note again that the offset for cylinder one (front cylinder on the right bank) is .9435" towards the front of the block from cylinder five on the left bank. Make certain to adjust your part offset position in the machine fixture or part offset table else you will ruin your block.
12. Remove the block from the machine, clean it, deburr it, lightly sand the chamfer you cut for the o'rings. Make certain the head threads are clean. A thread forming tool should be run through the head bolt holes on used blocks. The surface finish should be as shown in **photo 10**.

SLEEVE INSTALLATION:

1. It is not necessary or recommended to heat the block for sleeve installation. Leaving the block sit in the sun for a few minutes is sufficient. If the machining was done properly the sleeves will easily install with a shot filled plastic mallet and drive home with an aluminum plate and hammer.
2. Install the rubber o'rings into the lower sleeve grooves using minimal stretch. Do not roll the o'rings into the grooves. Lubricate the o'rings and lower area of the sleeves with the supplied lubricant - **photo 11**.
3. Apply a small amount of supplied Loctite flange sealant on perimeter of each sleeve upper flange as well as the siamesed flat. Only the top .500" of the flat area needs sealant.
4. Start cylinder number one sleeve using a plastic mallet. Drive it in just far enough to engage the upper flange. Start the adjacent sleeve and drive that in to the same depth as the first sleeve. Note that the side of the sleeve with the most holes in the flange goes towards the outside (exhaust side) of the block. Check to make sure the alignment half holes along the flats line up to form round holes. Adjust the clocking as necessary using a pointed tool carefully hammered in the alignment holes. Install the remaining two sleeves to the same depth again checking the clocking. Now drive them in the rest of the way using an aluminum plate and hammer. Lightly tap the pointed alignment tool in all the alignment holes to ensure the holes are round. The sleeves should protrude slightly from the deck surface. Install the sleeves on the opposite bank using the same procedure. **Photo 12**.
5. Clean off excess sealant from sleeve flange area. Install a pair of torque plates with head gaskets. Torque to 50ft./lbs. using ARP head bolts. This step ensures the sleeves are fully seated. Let stand at least two hours, preferably over night. Remove plates, and deck block head surfaces flat and as smooth as possible. Do not deck any more than is required or you will have problems with the pistons protruding too far out of the block. The only recommended head gasket is the MID specific Cometic gasket. **Photos 13, 14, and 15 and 16**.

Main cap studs and align honing are highly recommended.

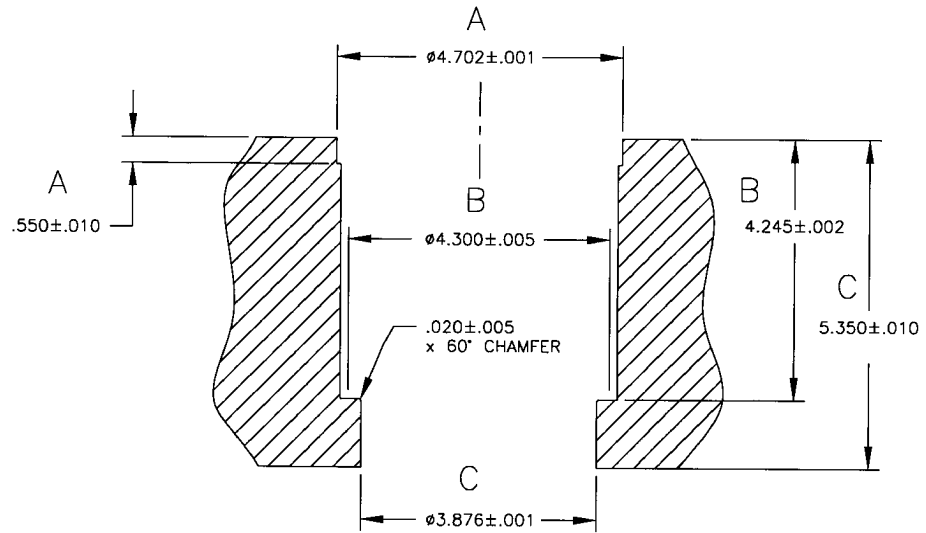
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BLOCK SPEC FORD 4.6 V8 COBRA MID


NOTE:

1. PRIOR TO BORING FOR SLEEVE INSTALLATION, BORE EXISTING SLEEVE TO FINISH BORE DIMENSION ± 0.010 STOPPING AT MAIN BEARING WEB, @ 5.950 ± 0.010 FOR HONING CLEARANCE.
2. USE ONLY WITH COBRA ENGINES WITH HEAD GASKETS FOR M.I.D. KIT
3. BORE CENTER 3.9382
4. OPT. MACHING, REMOVE CYLINDER WALL TO DEPTH OF 4.220 THEN CIRCULAR INTERPOLATE @ $\phi 4.300$ TO DEPTH OF 4.245.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVAL
A	1. $\phi 4.702 \pm 0.001$ WAS $\phi 4.700 \pm 0.001$ 2. $\phi 3.876 \pm 0.001$ WAS $\phi 3.875 \pm 0.001$ 3. ADDED NOTES 3 & 4	5/16/05	



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DR BY: CAD DEPT DATE: 3/17/05 CHG BY: MATERIAL: FINISHES:	 Darton International, Inc. FILE: BLOCK SPECIFICATION - FORD 4.6 V-8 COBRA M.I.D. SIZE: A SCALE: 1/2	Dwg No. REV: A SHEET 1 OF 1
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NOTES:

POST MACHINING INSTRUCTIONS

Revised: 03.28.2005

NOTES:

Ford™ 4.6L Engines with Darton MID Sleeves

PREPARATION PROCEDURES

1. Sleeves are delivered with a generous chamfer on the lower edge to help prevent piston damage. If sleeves are over bored and honed, it is mandatory that the bottom edge of the sleeve be chamfered or radiused (30 – 45 deg., Chamfer min. .050”) and completely deburred. Failure to do this will result in severe piston skirt damage and engine failure.
2. We recommend piston skirts be coated with a polymer coating, and piston tops with ceramic. Due to the acute rod angles at the bottom of the stroke with stroker cranks, pistons’ wall thrust is increased substantially, which requires generous chamfers at bore bottom and piston skirt coating to assure no scuffing and galling. Both coatings may allow the pistons to be fitted with less piston to wall clearance, which is desirable in terms of noise reduction and oil consumption on street driven vehicles. “Polydyne” and “Swain” are two well-known firms who can apply these coatings reliably.

ASSEMBLY

1. The block should have the cam and main journals checked and honed true if necessary.
2. The short block should be trial assembled without rings to inspect crankshaft, connecting rod, and connecting rod bolt clearance (.080” min.). Re-chamfer the sleeve bottom wherever it is ground for clearance. (Absolutely no burrs or sharp edges can remain on the bottom of the bore.) Minimum recommended ring gaps using ductile iron top and cast iron second rings are as follows: *(more gap may be used and is beneficial)*
 - Street performance use – top ring end gap min. .004” x bore diameter normally aspirated, second ring .005” x bore diameter.
 - Racing use – .0045” x bore diameter top, .0055” x bore diameter second normally aspirated.

- Street with nitrous oxide – .005" x bore diameter top, .006" x bore diameter second.
 - Drag racing with nitrous oxide – .007" x bore diameter top and second.
 - Supercharged or turbocharged – .006" x bore diameter top and second.
3. We highly recommend the use of 4032 alloy pistons for normally aspirated street use and 2618 alloy for racing, boosted or nitrous street use. 4032 is a low expansion alloy best suited for street use where one would want minimum piston to wall clearance to minimize piston rock, noise and oil consumption. 2618 alloy has superior strength and is the preferred alloy for racing use or street use with nitrous. But this alloy requires significant increases in piston/wall clearance.
 4. Both cylinder and align honing must have deck plates installed with the same type gaskets, fasteners as will be used in operation. Honing finish should be done according to the ring face material. For moly rings, generally no finer than 400 grit else the rings may not seat properly for street use; 280 grit for chrome faced rings. A plateau hone should be stroked through the cylinders as a finishing operation. **It is of utmost importance that the cylinder walls be thoroughly cleaned after honing to remove abrasives and metal particles.** Spray washing, or hot tanking is insufficient. Use paper towels coated with ATF or WD40 to wipe down cylinder walls after the wash operation. Continue wiping with towels and ATF until the towels show no more signs of dirt pick up.

Note: Honing head must be modified to accommodate stones and allow for over-stroke of .200. Piston to wall clearance must be reduced beyond piston manufacture recommendations.

5. *Tip:* When installing pistons into cylinders, coat pistons and rings with ATF instead of motor oil for faster and more reliable ring seating.

COOLING

The **Darton** ductile iron **MID** sleeves were designed specifically for racing and high performance street use. The sleeves are heavy wall construction, designed to remain round for effective ring sealing under conditions of high power output and stress. More power means more heat. This heat must be effectively transferred to the cooling system to prevent damage to the piston and sleeve. Roughly one third of the heat energy of the fuel is lost to the cooling system. The stock Ford cooling system was designed for

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400 horsepower and a stock cylinder block with cast-in dry liners. The **Darton** kit effectively converts the block to a wet sleeve configuration as used on diesel engines. One cannot expect the original cooling system to effectively cool and engine producing two or more times the power of the original engine, along with a modified cylinder arrangement. We recommend "Evans NPG+™" coolant be used as well as Evans LS-1 reworked water pump utilizing a relocated thermostat. High output applications may also require a larger radiator and coolant fan. Evans coolant is recommended because of the potential for hot spots and cavitation around wet style sleeves. We realize that most engines built will produce well in excess of the stock rated horsepower making cooling system enhancements a must. However, we have customers reporting success with large bores, stock cooling systems, therefore your cooling system requirements/modifications should be dictated by individual usages.

BREAK-IN, TURNING

Fill the engine with a good grade of mineral oil (not *synthetic*) with viscosity for your bearing clearance and intended use. **Prime the oil system** before engine start with ignition off using the engine or dyno starter. We require break-in and tuning using an engine dyno or chassis dyno as follows:

- ∑ After initial start up, warm up engine at 2000–2500, at no more than 100–150 ft. pounds of torque for 15–30 minutes. Precaution should be exercised to prevent excessively rich or lean conditions, which will gall the cylinders. Monitor oil pressure and temperatures.
- ∑ After initial run, adjust valves if using adjustable valve train and re-torque heads. Check for leaks.
- ∑ Street engines will require multiple run-ins with increasing rpm and load up to maximum output.

Use of a dyno allows one to apply a pre-set load to allow the piston rings, and other components to seat properly. It is also much easier to monitor temperatures and pressures than while driving. Most dynos are equipped with O₂ and EGT probes to aid in tuning. The timing and fuel curve needs to be tailored to your particular engine to ensure the engine stays out of detonation, which will lead to engine failure. A racing engine is generally built with sufficient clearance to require no further break-in after dyno tuning and power runs. **However, we recommend head bolt torques be re-checked cold and retorqued if necessary after dyno testing to guarantee gasket seal.** Remember to replace oil and filter after the dyno session as bearing coatings and metal particles will be trapped in the oil filter.

Inspect the oil for foreign material and excessive bearing flakes.

A street engine should be driven moderately for the first thousand miles, as follows:

- full throttle high torque power usage should be limited and never be used until the engine has been running for at least 15 minutes.
- from 0–500 miles, do not exceed 4000 rpm.
- from 500–1000, do not exceed 6000 rpm.
- over 1000 miles, no restrictions.

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Also, do not run at the same speed for extended periods during break-in. Make certain the engine is operating at proper coolant temperature and oil pressure. Do not allow the engine to overheat. Make necessary changes if required (radiator, fan, turning) to get the engine to run in the proper temperature range. We also recommend you do not run synthetic oil until at least 5000 miles. Synthetics work so well that the engine will never break in properly if it is used too soon.

NOTES / CAUTIONS / WARNINGS

1. Proper eyewear protection should be worn at all times during block machining.
2. Use of appropriate breathing filtration is highly recommended.
3. Observe all cautions and warnings on manufacturers MSDS's.
4. Failure to follow installation instructions will result in unsatisfactory performance and may involve sleeve distortion, water leaks, oil leaks, compression leaks or combinations thereof.
5. All sleeves are warranted against manufacturing defects for 1 year from date of sale. Damage as the result of engine failure is not covered, nor is any consequence of such damage weather or not caused by sleeves.
6. Caution must be exercised as old sleeves are bored out to prevent tearing of aluminum in block and possible tool breakage; original sleeves are ribbed and cast in place.
7. All machining must produce a good surface finish and the tolerances must be maintained to assure a quality fit and sleeve seal.
8. Field service and singular sleeve replacement is possible and practical using a slide hammer sleeve puller with the drive mandrel "Flatted" and oriented to provide main web clearance. Sleeves can then be ordered from Darton, by cylinder number.

NOTES:



PHOTO 1



PHOTO 2

NOTES:



PHOTO 3



PHOTO 4

NOTES:



PHOTO 5



PHOTO 6

NOTES:



PHOTO 7



PHOTO 8

NOTES:



PHOTO 9



PHOTO 10

NOTES:



PHOTO 11



PHOTO 12

NOTES:



PHOTO 13



PHOTO 14

NOTES:



PHOTO 15

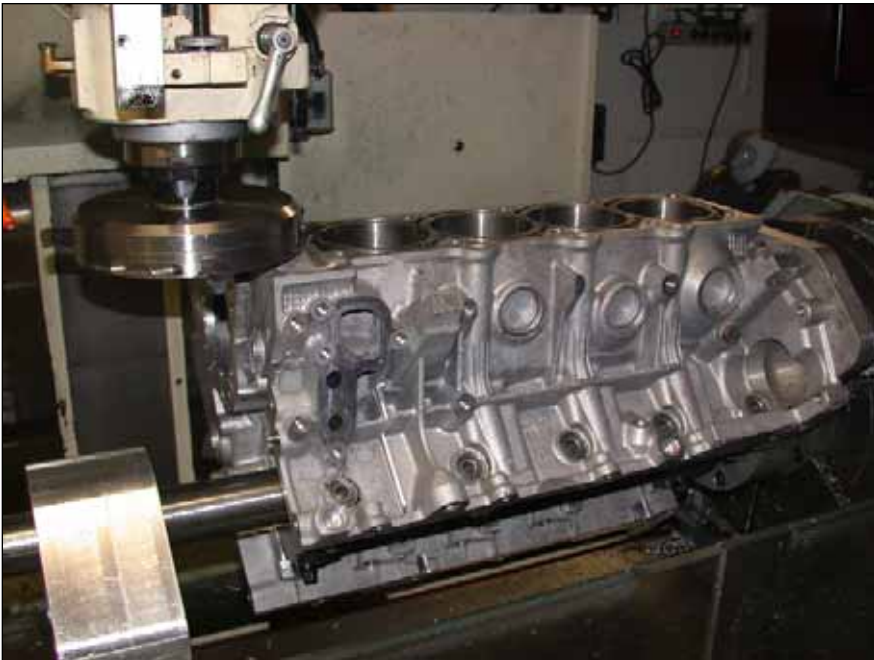



PHOTO 16

EVANS[®] PRODUCTS

FINALLY, A HIGH PERFORMANCE COOLANT PUMP FOR LS1/LS6 ENGINES.



EVANS COOLING SYSTEMS, INC. continues to expand their product line with the release of a high flow coolant pump and pulley combination for the hot-running GM LS1/LS6 engines. The new LS1 Coolant pump and pulley combination, part number EP3913, is designed to fill the current void in the LS1 Aftermarket. Flowing over 20 percent more than the OEM style replacement pumps available, the EP3913 increases the cooling efficiency in "built-up" LS1 Corvettes, Camaros and Firebirds.

Evans has changed the design of the OEM casting to include a Billet pulley hub and heavy duty 3/4" shaft bearing assembly. The EP3913 also includes the Evans 3.8" OD 8 vane scrolled impeller to reduce parasitic horsepower loss at high RPM. A new serpentine belt must be purchased separately for the specific application. Belts are available through Evans Cooling Systems for **with core exchange credit**. Corrosion free EB3913-C or Camaro/Firebird—EB3913-CF.

The EP3913 is available for ceramic-coated housing is available at an extra cost of \$125 to finish the look of the pump in a show car. Ceramic-coating is done on both the inside and outside of the housing.

EP3913 High Flow Coolant Pump with Pulley	LS1/LS6 Corvette Serpentine Belt	EB3913-CF Camaro/Firebird Serpentine Belt
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EVANS
NPG COOLING SYSTEMS™

Coolant • Radiators • Pumps • Accessories

Darton recommends the use of **Evans** coolant with all **MID** kits!



Finally, a High Performance Coolant specifically formulated to handle the extreme conditions of racing and high performance automotive, marine and motorcycle applications.

Evans Cooling Systems, Inc. introduces NPG-R, its newest addition to their innovative line of waterless Engine Coolants. NPG-R is specifically formulated to handle the extreme conditions of racing and high performance automotive, marine and motorcycle applications. Engines previously unable to be effectively cooled with water or conventional water-based antifreezes now have the option of the improved heat transfer formula of NPG-R.

NPG-R exhibits superior coolant flow, as it is less viscous than the popular NPG+. Its improvement in thermal-conductivity increases the ability of NPG-R to transfer extreme heat away from the engine coolant jacket. This provides superior engine metal temperature control. High coolant temperature related detonation is also eliminated with NPG-R as it stays in a more liquid state instead of converting to vapor and creating hot spots within the engine coolant jacket. Remaining in a more liquid state allows NPG-R to remove additional heat from the cylinder heads when compared to other coolants. The heat is then transferred away from the engine providing continuous control of cylinder head metal temperatures.

The reduced viscosity of NPG-R makes it more compatible with small tube copper-brass radiators while providing the superior cooling of Evans Waterless Coolants. (NPG+ and NPG are only recommended for large tube aluminum radiators.) All metals, including Magnesium, are safe to use with NPG-R. Although NPG-R is safe for all metals and contains no water, an annual coolant change is suggested for racing vehicles. For maximum performance street driven vehicles running NPG-R should change coolant every other year.

NPG-R does not freeze or boil-over. In cold temperatures (down to -10°F) NPG-R will not freeze and expand like conventional water-based antifreezes potentially cracking the engine block. In contrast NPG-R contracts into thick slurry - never becoming a solid. With a boiling point of 400°F at 7psi, NPG-R will never boil-over because it immediately condenses back to a liquid within the cylinder head coolant jacket, maintaining a liquid contact on all metal surfaces at all times.

As with NPG+ and NPG, NPG-R is a stand-alone coolant. Therefore, NPG-R requires all the existing antifreeze and water to be removed from the radiator, engine block and heater core. (Evans Prep Fluid is available for smaller capacity systems where the engine block cannot be fully drained.) Once system is empty fill 100% with NPG-R. A Test Strip is included with all purchases as a guide to a successful conversion. Technical assistance is available to assist in determining which Evans Waterless Coolant is right for your application.

EVANS
NPG COOLING SYSTEMS™

Coolant • Radiators • Pumps • Accessories

MPG+ for all street applications.
MPGR for full race applications.



**Not actual gasket shown.*

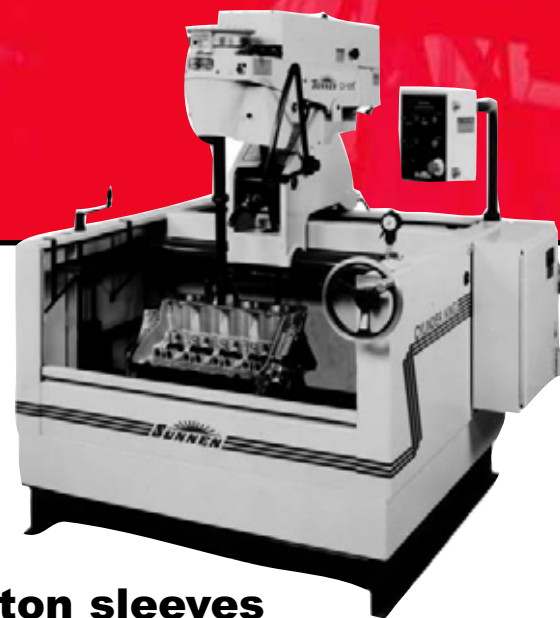
FOR BEST RESULTS:

Darton recommends the use of a Cometic M.I.D. MLS head gasket. These head gaskets are specifically made for use with our M.I.D. kits.

NOTES/CAUTIONS:

1. Make sure that block and head surfaces are machined within proper RMS specification.
2. Depending on the type of head bolts used, a re-torque of head bolts to proper specifications may be required.

Sunnen CV-616 Setup



The cost-effective Sunnen CV-616 Automatic Cylinder Hone is one of the most versatile machines you can have in your shop. You can count on consistent results as the CV-616 produces the most precise cylinder bores possible, cylinder after cylinder, block after block.

Job: Ford 4.6L block with Darton sleeves

	Semi Finish	Plateau Finish
<i>Cylinder Part #:</i>	600-100 (4")/600/120	600-120 (4.125")/600/120
<i>Stone Part #:</i>	EHU 412	C30 PHT 731
<i>Stroke Length:</i>	6"	6"
<i>Feed Rate:</i>	4	4
<i>Top Over Stroke:</i>	5/8"	5/8"
<i>Bottom Over Stroke:</i>	3/8"	3/8"
<i>Spindle Speed:</i>	170 rpm	170 rpm
<i>Stroke Speed:</i>	41 spm	41 spm
<i>Honing Oil:</i>	MAN 845	MAN 845
<i>Stroke Scale:</i>	2 3/4" PNP 1275	2 3/4" PNP 1275
<i>Guide Shoes:</i>	CK-3070	CK-2070
<i>Cross Hatch Angle:</i>	25-30	25-30
<i>Material:</i>	Ductile	Ductile
<i>Cylinder Length:</i>	5 5/8"	5 5/8"
<i>Load Meter:</i>	30%	20-30%
<i>Time Cycle:</i>		45 seconds

Sunnen CV-616 Setup

The cost-effective Sunnen CV-616 Automatic Cylinder Hone is one of the most versatile machines you can have in your shop. You can count on consistent results as the CV-616 produces the most precise cylinder bores possible, cylinder after cylinder, block after block.



Results with Sunnen Honing Stones on Darton Cylinder Sleeve Material

	<i>EHU 412</i>
RA	23.14 α "
RY	231.14 α "
RZ	184.4 α "
RPK	26.34 α "
RVK	68.14 α "
RK	80.14 α "
MR1	7%
MR2	86%

	<i>EHU 518</i>
RA	25.1 α "
RY	266.2 α "
RZ	198.3 α "
RPK	29.9 α "
RVK	44.5 α "
RK	89.7 α "
MR1	6%
MR2	88%

	<i>EHU-412</i>
	<i>C30 PHT 731 - 45 Seconds</i>
RA	15.4 α "
RY	162.4 α "
RZ	127.4 α "
RPK	10.5 α "
RVK	40.9 α "
RK	35.4 α "
MR1	5%
MR2	88%

	<i>EHU 518</i>
	<i>C30 PHT 731 - 30 Seconds</i>
RA	9.0 α "
RY	132.0 α "
RZ	93.5 α "
RPK	7.8 α "
RVK	38.4 α "
RK	23.8 α "
MR1	5%
MR2	81%

Sunnen CV-616 Set-up

JHU 623

RA	10 α "
RY	99.6 α "
RZ	85.5 α "
RPK	17.8 α "
RVK	18.8 α "
RK	34.7 α "
MR1	10%
MR2	89%

JHU 623

C30 PHT 731 - 15 Seconds

RA	6.4 α "
RY	79.7 α "
RZ	62.3 α "
RPK	4.8 α "
RVK	13.3 α "
RK	20.9 α "
MR1	4%
MR2	89%

Results obtained with Sunnen MAN 845 honing oils. Results may vary with other oils.

